

REMARKS

Applicants respectfully request reconsideration. Claims 7, 25-27, 38-41 and 49 were previously pending in this application. By this amendment, Applicants are canceling claims 25-27 and 39-41 without prejudice or disclaimer. Claims 7, 38, and 49 have been amended. Claim 7 has been amended to include limitations from claims 25-27, now cancelled and to identify a UCP inhibitor as non-omega-3, -6 fatty acid. Claims 38 and 49 have been amended to indicate that the plant is contacted with a UCP inhibitor to decrease activity of UCP in the plant cell wall or plasma membrane or chloroplast and that the inhibitor is a non-omega-3, -6 fatty acid. Support for the amendment to claims 38 and 49 can be found in the specification as filed, at least at page 4, line 32 through page 5, line 3 and page 10, lines 24-29. As a result, claims 7, 38, and 49 are pending for examination with claims 7, 38, and 49 being independent claims. No new matter has been added.

Rejections Under 35 U.S.C. §112

Written Description

The Examiner rejected claims 26, 27, and 39-41 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

The Examiner indicates at page 3 of the Office Action mailed June 27, 2005 that Applicants' disclosure does not provide support for a written description of the broadly claimed genus or genera of UCP inhibitors. Applicants have cancelled claims 26, 27, and 39-41 thus obviating the basis of the rejection. Applicants have moved limitations from claims 26 and 27 into claim 7, and the amended claim is drawn to use non-omega-3, -6 fatty acids rather than the more extensive genus of UCP inhibitors that is set forth in the application as filed.

The use of non-omega-3, -6 fatty acids to decrease UCP activity is described in the specification as filed, see for example, page 4, lines 7-14 and page 23, lines 3-9. Applicants respectfully submit that based on the teaching provided in the specification as filed, one of ordinary skill would recognize that Applicants were in possession of the claimed invention at the time of filing.

Accordingly, withdrawal of the rejection of claims 26, 27, and 39-41 under 35 U.S.C. §112, first paragraph, is respectfully requested.

Enablement

The Examiner rejected claims 7, 25-27, 38-41, and 49 under 35 U.S.C. §112, first paragraph, as failing lacking enablement.

Applicants have cancelled claims 26, 27, and 39-41 and have amended claims 7, 38, and 49 to indicate that a non-omega-3, -6 fatty acid is the UCP inhibitor used in the claimed methods to decrease the activity of UCP in plant cell wall or plasma membrane or chloroplast, thereby regulating fuel metabolism, producing a nutritionally enhanced plant, or preventing infection.

The Examiner indicates at page 4 of the Office Action mailed 6/27/2005 that although Applicants assert that the term plant is to be interpreted broadly to include algae, “the specification does not set forth a broad definition of plants that would encompass unicellular flagellar algae”. Applicants submit that the specification as filed sets forth a definition of “plant” at page 11, lines 8-10 that includes the algae *Chlamydomonas reinhardtii*. Applicants have provided a clear definition of “plant” as: (A)s used herein, the term “plant” is used in its broadest sense. The term plant includes, but is not limited to, any species of woody, ornamental or decorative, crop of cereal, fruit or vegetable plant, and algae (e.g. *C. reinhardtii*). Thus, the term “plant” is clearly defined in the specification as filed as including the unicellular flagellar algae *C. reinhardtii*. Applicants submit that as set forth by the Court in Phillips v. AWH Corp., No. 03-1269, 03-1286, 2005 U.S. App. (Fed. Cir. Jul. 12, 2005)

....our cases recognize that the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs. See CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366 (Fed. Cir. 2002). In other cases, the specification may reveal an intentional disclaimer, or disavowal, of claim scope by the inventor. In that instance as well, the inventor has dictated the correct claim scope, and the inventor’s intention, as expressed in the specification, is regarded as dispositive. See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc., 242 F.3d 1337, 1343-44 (Fed. Cir. 2001)

Applicants submit that the clear definition Applicants provided in the specification should be used to define the claim scope that corresponds with the meaning of the term “plant”

as including the green algae *C. reinhardtii* as well as the additional plant species listed on page 11 of the specification as filed.

The court in Phillips V AWH Corp. also indicated that extrinsic evidence may be helpful to interpret the meaning of claim terms, although deemed it less important than intrinsic evidence, stating:

(a) Although we have emphasized the importance of intrinsic evidence in claim construction, we have also authorized district courts to rely on extrinsic evidence, which “consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.” Markman, 52 F.3d at 980, citing Seymour v. Osborne, 78 U.S. (11 Wall.) 516, 546 (1870); see also Vitronics, 90 F.3d at 1583. However, while extrinsic evidence “can shed useful light on the relevant art,” we have explained that it is “less significant than the intrinsic record in determining ‘the legally operative meaning of claim language.’” C.R. Bard, Inc. v. U.S. Surgical Corp., 388 F.3d 858, 862 (Fed. Cir. 2004), quoting Vanderlande Indus. Nederland BV v. Int’l Trade Comm’n, 366 F.3d 1311, 1318 (Fed. Cir. 2004); see also Astrazeneca AB v. Mutual Pharm. Co., 384 F.3d 1333, 1337 (Fed. Cir. 2004).

Applicants submit herewith for the Examiner’s consideration, a print out from NCBI taxonomy browser, which indicates that Chlamydomonadales is classified as part of the broader category of green plants in the NCBI plant taxonomy. Although the NCBI site includes a disclaimer regarding its authority in the nomenclature, one of ordinary skill in the art would recognize that its published taxonomic listing is in agreement with the definition provided in the specification as filed. Additionally, Applicants include herewith Table 1-1 from *Morphology of Plants*, by Harold C. Bold, Harper & Row, New York, 3rd edition, 1973, which indicates that Chlorophyceae (green algae) fall under the classification of green plants. Applicants submit that the inclusion of algae within the definition of “plant” is supported by the intrinsic evidence provided in the specification as filed and is additionally supported by the extrinsic evidence described herein.

The Examiner also indicates that Applicants have not correlated decreasing cell wall, plasma membrane, or chloroplast UCP expression (activity) with any of the claimed effects of the claimed methods in any plant or *C. reinhardtii*. Applicants address each of these effects below followed by a broader response to the rejection.

Methods for regulating fuel metabolism in a plant by reducing UCP activity.

Page 10 of the specification as filed describes discoveries indicating that the alteration of UCP activity can result in an alternation of the membrane potential in a plant cell. The ability to manipulate the membrane potential, e.g., of the plant cell wall, provides the ability to control the fate of the cell. When the cell wall/plasma membrane potential is increased by increasing or decreasing expression of UCP in the cell wall/plasma membrane, the cell is able to alter its ability to process energy and to grow more efficiently than it would otherwise, e.g. when UCP activity is not increased. Thus, the specification indicates that a plant cell is able to differentiate more efficiently when UCP is increased in mitochondria, which is useful under conditions when light is scarce and the temperatures are cold. This shift allows the cell to use alternative non-photosynthetic fuel sources when light is scarce. The invention involves the use of this discovery to alter a plant's metabolism. If one desires to increase plant metabolism then UCP activity in cell wall, plasma membrane or chloroplast can be increased. Such an increase in UCP activity would be desirable, for instance, when it is desirable to increase crop yields (even when solar energy is scarce or in cold temperatures) or to protect plants against cold-induced injury (in cold environments or during times of frost). The claimed methods of the invention relate to a decrease in UCP activity in cell wall, plasma membrane, or chloroplast, which causes the cell wall/plasma membrane potential of a cell to decrease, resulting in a shift in the plants to the use of alternative energy sources. The specification also indicates at page 10, lines 24-26 that a decrease in UCP activity can be useful when alternative energy sources such as acetate are scarce but adequate solar energy is available – clearly indicating a link between reducing UCP activity and regulating fuel metabolism. Thus, decreasing UCP activity with the methods of the invention correlates with the regulation of fuel metabolism in plants.

Methods for producing a nutritionally enhanced plant by reducing UCP activity.

In contrast to the Examiner's comments at page 6 of the Office Action, Applicants submit that in the context of the specification as filed, the nutritional value a plant relates to the caloric nutritional value of a plant, not the level of antioxidant species in a plant.

Page 10 of the specification at lines 19-26 discloses that decreasing cell wall/plasma membrane activity causes the membranes to accumulate fat and that the plants can be harvested

and the fat isolated and processed for consumption. This increase in fat – a nutritional product for consumption – represents a nutritional enhancement in the plant that occurs through the inhibition of UCP activity in cell wall and plasma membrane. Applicants have provided an example of such a plant at page 10, line 21-22, which describes that the reduction of UCP activity may be useful in plants grown in warm sunny environments such as palm trees. Applicants submit that one of ordinary skill in the art would recognize that an increase in oils would be a nutritional enhancement. Species of palm trees are used to harvest palm oil, which is recognized by those of ordinary skill in the art as a food product. An increase in the levels of “fat” in palm trees and other crop plants, as set forth in the claimed methods, would be understood by those of ordinary skill in the art to be an increase in the nutritional value of the plant.

Methods for preventing infection in a plant by reducing UCP activity.

The specification as filed also describes the reduction of UCP activity as a method of reducing infection in a plant. Page 10, lines 26-29 describe the effect of decreasing the activity of UCP in these alternative membranes, which causes an increase in free radicals. Increases in free radicals have been demonstrated to be useful in increasing a plants resistance to infection (see e.g., US Patent 6,166,291). The Examiner suggests that the specification is not enabling for a method of preventing infection in a plant by decreasing UCP expression or activity because it is well known in that art that oxygen reactive species are toxic to the plant and their role in prevention infection is to destroy areas of infection in a localized fashion”. Applicants submit that US patent 6,166,291 describes that an increase on O₂-reactive species increases resistance to infection in plants (see col. 2, line 61-65).

The Examiner indicates at page 6 of the Office Action that claim 49 is “drawn to preventing infection in a plant by decreasing the expression or activity of UCP in a plant in an amount to prevent an increase in oxygen free radicals to prevent infection in a plant”. Applicants submit that this statement does not reflect the pending claim. This identical issue was previously raised by the Examiner in the Office Action mailed December 22, 2003 and was addressed in the response to that Office Action mailed June 17, 2004. In that prior response Applicants amended claim 49 and provided the following argument:

The Examiner has pointed out a discrepancy in claim 49 with the specification. The Examiner correctly pointed out that on page 42, lines 6-16 the specification teaches that increased UCP expression levels were directly correlated with decreases in reactive peroxide oxygen species thereby suggesting that UCP functions to prevent increased levels of oxygen free radicals. This finding is found in other places of the specification, such as page 10 lines 19-31. A typographical error appeared in claim 49. The phrase "to prevent an increase in oxygen free radical" should correctly read "to promote an increase in oxygen free radicals". The proper reading is sufficiently supported in the specification. The amendment to claim 49 to delete the phrase should be sufficient to correct the problem.

Applicants are unclear as to the version of the claims under consideration by the Examiner. The phrase referred to by the Examiner was removed from the claim in the response filed June 17, 2004. Applicants submit that the pending claim is supported by the specification which states at page 10, lines 26-27 that increasing the activity of UCP results in an increase in free radicals and that increases in free radicals have been demonstrated to be useful in increasing a plant's resistance to infection.

Overall Enablement Issues

Applicants have amended the claims, which are currently drawn to the use of a non-omega-3, -6 fatty acid to decrease UCP activity in the cell wall or plasma membrane of a plant cell. Applicants respectfully submit that the claims as amended are fully enabled by the specification as filed. Applicants submit that the specification provides sufficient teaching to permit of ordinary skill in the art to use the claimed methods to contact a plant with a non-omega-3, -6 fatty acid thereby decreasing UCP activity in the plant cell wall or plasma membrane or chloroplast of the plant. The method can be used, as described in the specification as filed, to regulate fuel metabolism, produce a nutritionally enhanced plant, or prevent infection in the plant.

The invention relates to the discovery that UCP is present in non-mitochondrial membranes. In view of this discovery it is now possible for one of skill in the art, following the guidance set forth in the specification to regulate cellular metabolism using the UCP inhibitors. Applicants have demonstrated with working examples that UCP is present in cellular membranes

other than the mitochondrial membrane. Further Applicants have taught that if this non-mitochondrial UCP is manipulated using compounds that are known to manipulate UCP expression/function, that different metabolic states can be achieved in the plant cell. For instance by contacting a cell membrane UCP with a known UCP inhibitor it is possible to shift the plant to the use of alternative energy sources, causing the plant to accumulate fat, which can be harvested and also increasing oxygen free radicals which has been demonstrated to be useful in protecting a plant against infection.

The claimed methods are drawn to contacting the plant with a non-omega-3, -6 fatty acid and would not require undue experimentation in view of the teachings found within the specification. Applicants have taught which membranes have UCP and how to regulate UCP in order to achieve the desired effect. The specification discloses non-omega-3, -6 fatty acids as UCP inhibitors, and these are compounds known to those of skill in the art. The use of this compound in the claimed methods would not require undue experimentation.

Applicants submit that the claims, as amended are enabled. Applicants maintain that full consideration of each and all of the *Wands* factors [*In re Wands* 858 F.2d 731, 737, 740, 8 U.S.P.Q.2d 1400, 1404, 1407 (Fed. Cir. 1988)] in view of the state of the art at the time of filing, leads one to the reasonable conclusion that practicing the invention would not require undue experimentation.

Applicants submit that one of ordinary skill in the art can reliably make and use a non-omega-3, -6 fatty acid as set forth in the claims as amended. In the art of using an identified inhibitors such as a non-omega-3, -6 fatty acid to decrease activity of UCP, the predictability of the art as a whole for this aspect of the invention is high. Numerous model systems (both cellular and whole organism) were available at the time of filing to test various aspects of the efficacy of a non-omega-3, -6 fatty acid. For example, one can test the non-omega-3, -6 fatty acid compositions in plant cells, including *C. reinhardtii*, to determine the effect on activity of a UCP gene, as well as to test the effect nutritional value, effect on fuel metabolism, and resistance to infection. Whole plants also can easily be tested in a similar fashion. It is predictable from these and other possible routine experiments that one can determine the effect and/or efficacy of non-omega-3, -6 fatty acid as a UCP inhibitor in plants.

The claims as amended are not overly broad. The claims are drawn to the use of a non-omega-3, -6 fatty acid to inhibit activity of UCP in plant cell wall, plasma membrane, or chloroplasts. Applicants have identified, for the first time, the presence of UCP activity outside of the mitochondria, and have determined that the UCP inhibitor, non-omega-3, -6 fatty acid, can be used for the regulation of fuel metabolism in plants, production of nutritionally enhanced plants, and prevention of infections in plants. Applicants submit that the claimed methods are not overly broad in scope when viewed in the context of the examples and models provided in the specification, coupled with the high level of knowledge and skill in the art.

Applicants also maintain that analysis of the remaining *Wands* factors: 1) existence of working examples, 2) guidance presented, 3) quantity of experimentation, 4) the nature of the invention, 5) the state of the prior art, and 6) the level of one of ordinary skill in the art, also support a finding of enablement. Applicants submit that none of these factors would weigh against a finding of enablement for the claimed invention. For example, very little experimentation is required to use a non-omega-3, -6 fatty acid to reduce the expression or activity of UCP in a plant, since the non-omega-3, -6 fatty acid has been disclosed in the specification as filed, along with methods of contacting plants with the inhibitor. Applicants maintain that adequate examples and guidance were provided.

Applicants have identified non-omega-3, -6 fatty acids as inhibitors of UCP activity, and the specification as filed, presents methods for testing the function of the inhibitor molecules such as non-omega-3, -6 fatty acid that were well known at the time of filing. Applicants also cited several references that provide such methods and provides *C. reinhardtii* as an art-accepted model system. These descriptions provide sufficient guidance to one of ordinary skill in the art at the time of filing (in 2000) to use a non-omega-3, -6 fatty acid in the claimed methods. With respect to the working examples, Applicants have provided broad terminology that would be easily understandable to one of ordinary skill in the art, and the specification also includes illustrative examples in a model cell system as noted above. Thus, the examples and guidance presented support a finding of enablement.

The quantity of experimentation that would be required to practice the claimed invention is not excessive. Rather, the nature and quantity of such experimentation is completely routine

in the relevant art. Testing a non-omega-3, -6 fatty acid for a decrease in the activity of UCP and/or for the testing of the effect of a non-omega-3, -6 fatty acid on a plant's fuel metabolism, nutritional value, and resistance to infection are standard experimental procedures in plant biology. The experimentation required to utilize a non-omega-3, -6 fatty acid in the claimed methods would be routine as shown by the cited references and numerous other references publicly available at the time of filing of the application. Thus, any experimentation required would not be undue.

Applicants have claimed the use of a non-omega-3, -6 fatty acid for the decrease in UCP activity in plant cell wall, plasma membrane, or chloroplasts. The nature of the invention, inhibition of UCP activity and/or expression, is well known to one of ordinary skill in the art, although the applications proposed are novel.

With respect to the state of the art and the level of skill in the art, Applicants maintain that for the standard procedures contemplated in the application, the level of skill in the art is high. Applicants maintain that the person of skill in the art of plant biology would know how to prepare, test and use UCP inhibitors in the claimed methods.

In summary, an assessment of the claims as amended under a full analysis of the *Wands* factors favors a conclusion that only routine experimentation would be required of one of ordinary skill in the art to practice the claimed invention throughout its scope.

Accordingly, Applicants respectfully request that the Examiner withdraw the rejections of claims 7, 25-27, 38-41, and 49 under 35 U.S.C. §112, first paragraph.

Rejections Under 35 U.S.C. §101

The Examiner rejected claim 41 under 35 U.S.C. §101 as directed to non-statutory subject matter. Applicants have cancelled claim 41 thereby obviating the rejection.

Accordingly, withdrawal of the rejection of claim 41 under 35 U.S.C. §101 is respectfully requested.

Rejections Under 35 U.S.C. §102

The Examiner rejected claims 7, 25, 38, and 49 under 35 U.S.C. §102 as being anticipated by Allen M. et al. U.S. Patent No. 5,884,225 (the '225 patent).

The Examiner states that claims broadly drawn to methods for regulating or decreasing UCP expression or activity in a plant by any means are anticipated by the '225 patent. Applicants have amended claims 7, 38, and 49 to clarify that the methods include using a non-omega-3, -6 fatty acid to reduce UCP activity. Applicants submit that the '225 patent does not teach decreasing UCP activity with a non-omega-3, -6 fatty acid and therefore does not anticipate the claimed invention.

Accordingly, withdrawal of the rejection of claims 7, 25, 38, and 49 under 35 U.S.C. §102 is respectfully requested.

Rejections Under 35 U.S.C. §103

The Examiner rejected claims 7, 25-27, 38-41, and 49 under 35 U.S.C. §103(a) as being unpatentable over Kowaltowski, A.J. et al., FEBS Letters, 1998, Vol. 425,; pages 213-216 in view of itself. Applicants respectfully traverse the rejection.

The Examiner states that the selection of an antisense inhibitor of UCP activity would have been an obvious design choice because antisense inhibition is well known in the art. Although not agreeing with the Examiner's conclusion of the obviousness of the invention in view of the Kowaltowski et al. reference, the amendments made to claims 7, 38, and 49 and the cancellation of claims 25-27 and 39-41 to address other rejections by the Examiner, removed reference to antisense inhibitors from the claims. The amendments to the claims obviate the basis for the obviousness rejection based on Kowaltowski et. al.

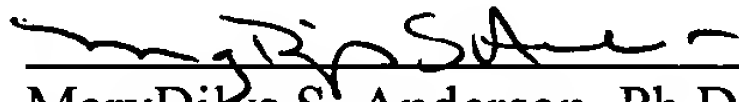
Accordingly, withdrawal of this rejection of claims 7, 25-27, 38-41, and 49 under 35 U.S.C. §103(a) is respectfully requested.

CONCLUSION

A Notice of Allowance is respectfully requested. The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in condition for allowance.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Respectfully submitted,
Martha K. Newell et al., Applicant(s)

By: 
MaryDikys S. Anderson, Ph.D.
Reg. No. 52,560
Wolf, Greenfield & Sacks, P.C.
600 Atlantic Avenue
Boston, Massachusetts 02210-2206
Telephone: (617) 646-8000

Docket No.: C1102.70002US00
Date: November 28, 2005
x11/27/05x